Requested Patent: GB2202112A

Title: IDENTIFYING REGIONS OF INTEREST IN A FIELD OF VIEW ;

Abstracted Patent: GB2202112 ;

Publication Date: 1988-09-14 ;

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Application Number: GB19880002092 19880130 ;

Priority Number(s): GB19870003928 19870219 ;

IPC Classification: G06K9/46 ;

Equivalents: ;

ABSTRACT:

A method for identifying a region of interest within a binary image array traces the boundary of each region A,B,C and assigns to each boundary pixel a value indicative of its respective region. Each pixel within each boundary is then assigned the value of its respective boundary pixel (Fig 3). Regions may then be selected on the basis of their size and/or the degree of correspondence to a predetermined shape. The method is particularly useful in Infra-Red imaging systems.

(12) UK Patent Application (19) GB (11) 2 202 112 (13) A

(43) Application published 14 Sep 1988

(21) Application No 8802092

(22) Date of filing 30 Jan 1988

(30) Priority data
(31) 8703928 (32) 19 Feb 1987 (33) GB

(51) INT CL⁴
G06K 9/46

(52) Domestic classification (Edition J):
H4T BEX
H4D 733 781 LFB

(56) Documents cited
None

(58) Field of search
H4D
H4F
H4T
Selected US specifications from IPC sub-classes
G06F G06K

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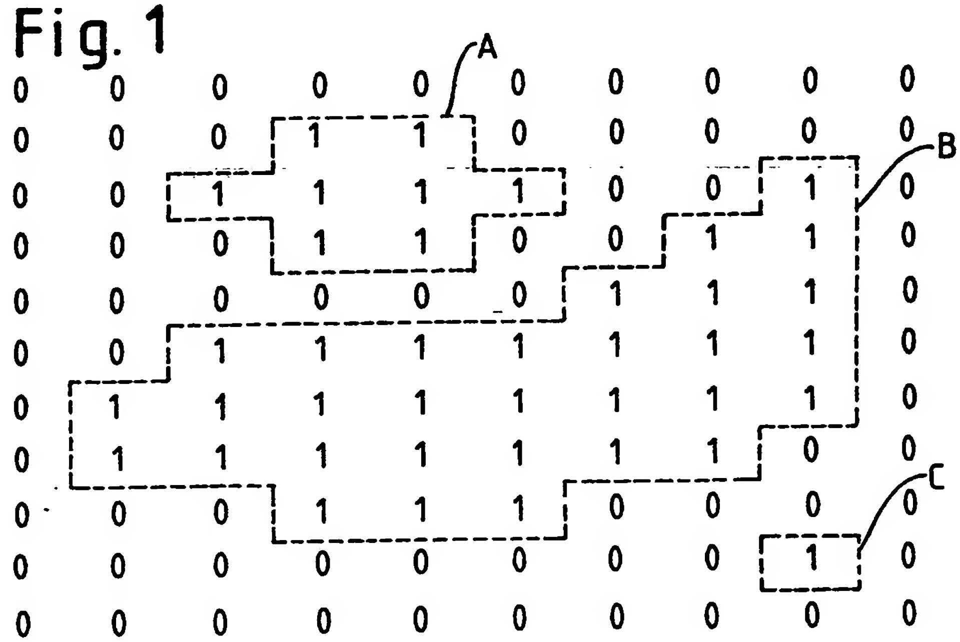
(54) Identifying regions of interest in a field of view

(57) A method for identifying a region of interest within a binary image array traces the boundary of each region A,B,C and assigns to each boundary pixel a value indicative of its respective region. Each pixel within each boundary is then assigned the value of its respective boundary pixel (Fig 3). Regions may then be selected on the basis of their size and/or the degree of correspondence to a predetermined shape.

The method is particularly useful in Infra-Red imaging systems.

Fig. 1



The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

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Fig. 1

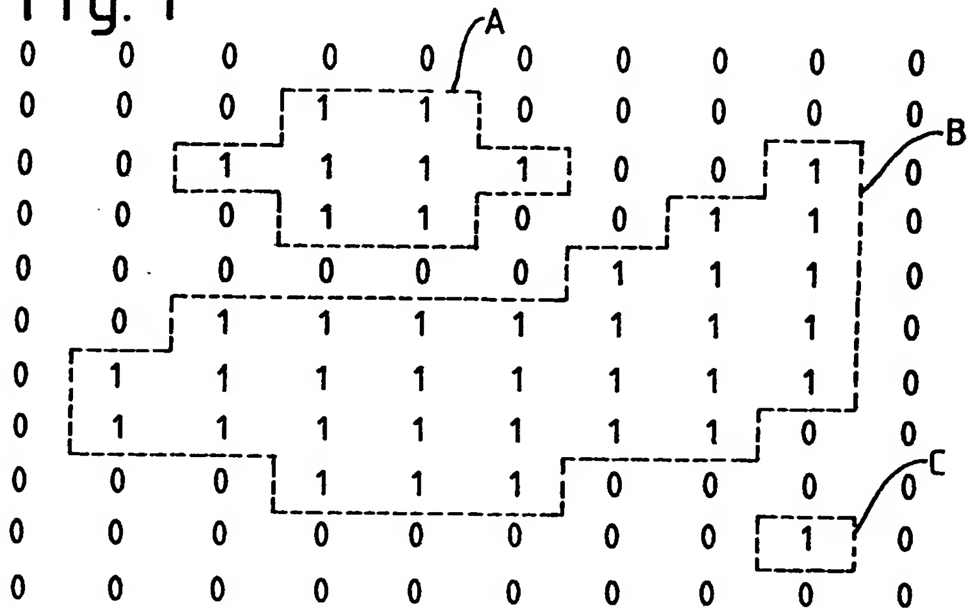

Fig. 2

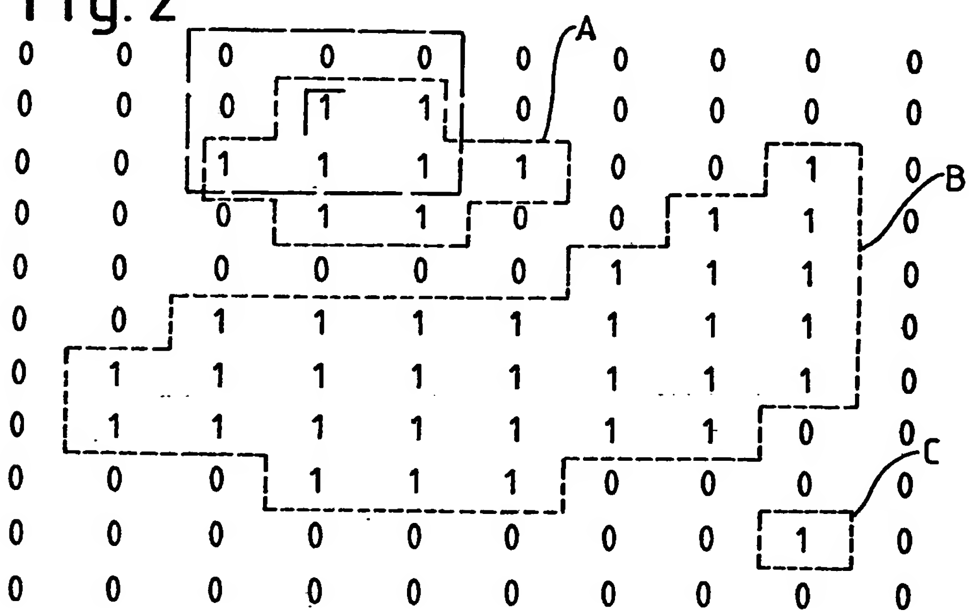

Fig. 3

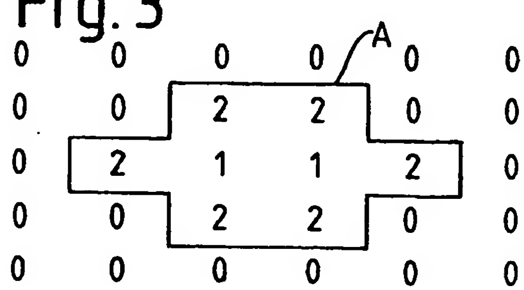

Fig. 4

A

0	0	0	0	0	0	0	0	0	0	
0	0	0	2	2	0	0	0	0	0	
0	0	2	2	2	2	0	0	3	0	B
0	0	0	2	2	0	0	3	3	0	
0	0	0	0	0	0	3	3	3	0	
0	0	3	3	3	3	3	3	3	0	
0	3	3	3	3	3	3	3	3	0	
0	3	3	3	3	3	3	3	0	0	
0	0	0	3	3	3	0	0	0	0	C
0	0	0	0	0	0	0	0	4	0	
0	0	0	0	0	0	0	0	0	0	

Fig. 5

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	1	1	0
0	0	0	0	0	0	1	1	1	0
0	0	1	1	1	1	1	1	1	0
0	1	1	1	1	1	1	1	1	0
0	1	1	1	1	1	1	1	0	0
0	0	0	1	1	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

IMAGE PROCESSING TECHNIQUES

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This invention relates to image processing techniques and is more particularly concerned with the identification of a region of interest within a viewed scene.

In a thermal image of a viewed scene, there may be more than one region of interest which is to be distinguished within the scene. When the thermal image is converted to a binary image more than one block of "1's" will be present in a background of "0's". It is therefore necessary to discriminate between the blocks to obtain a particular object of interest, for example, a target.

According to one aspect of the invention, there is provided a method of discriminating between regions in a binary image array corresponding to a viewed scene, the method comprising:-

tracing the boundary of each region and assigning the pixels of each boundary a value indicative of the respective region;

filling each pixel within the boundary of each region with the said value indicative of that region; and

selecting one of said regions by reference to its size relative to that of the other regions and/or by reference to the degree of correspondence between the shape or size of the region and that of a predetermined or calculated model.

For a better understanding of the invention, reference will now be made, by way of example, to the accompanying

drawings, in which:-

Figure 1 shows a binary image array of a viewed scene having three regions of interest;

Figure 2 shows the position of the first '1' located when the Figure 1 array is scanned;

Figure 3 shows the Figure 1 array with the boundary traced for one region;

Figure 4 shows the boundaries of all the regions of Figure 1 blocked in; and

Figure 5 shows the region selected.

In a binary image of a viewed scene, there may be more than one object imaged due to the presence of clouds or other objects within the viewed scene. An image array as shown in Figure 1 may then be obtained where three distinct regions are defined by "1's" in a background of "0's". It is therefore necessary to discriminate one particular image or region from the others, for example, a region corresponding to a target. In order to do this each block boundary is first traced using an eight-point chain code operator.

The binary image array shown in Figure 1 is scanned row-by-row from left to right starting at the top left hand corner of the array, until the first '1' is located (shown in Figure 2). A boundary is known to exist on two sides of the squares surrounding the '1' i.e. a border area between adjacent "1's" and "0's". This first pixel having a value of '1' is then assumed to be part of an image region

labelled A, this region being assigned a value of '2'. The value of the first pixel is then changed to '2' and a 3 x 3 mask shown below is placed over the pixel position, X:-

I	J	K
Q	X	L
P	N	M

Each pixel lying under the mask is then examined in turn in a clockwise position starting at the position L until a '1' is found. Position L is chosen because positions I, J, K, and Q are known to be '0's' otherwise the first '1' would be in a different position. The letter location of the pixel is noted once another '1' has been found i.e. whether the next '1' is at position I, J, K, L, M, N, P, or Q, and its value is set to the value of A i.e. '2' in this case. The mask is then moved to this new position as it represents a continuation of the boundary and the operation is repeated as before but starting at a pixel position determined by the previous letter location, i.e:

if the letter location was I, start at P
if the letter location was J, start at I
if the letter location was K, start at I
if the letter location was L, start at K
if the letter location was M, start at K
if the letter location was N, start at L
if the letter location was P, start at L
if the letter location was Q, start at P

The above procedure is repeated and the boundary is extended until the starting position is reached, the procedure only terminating when looking for the next boundary position a boundary is already known to exist there i.e. a pixel having a value of '2' is found. The boundary for region A is shown in Figure 3. All pixels forming part of the right hand side boundary of the reigon are noted and if at any stage, the boundary touches the edge of the image array, a border of '0's' one pixel deep is assumed to exist around the sides of the array. The region is then filled in by assigning all pixels within the boundary a value of '2'. This is achieved by scanning each row moving left to right, by treating each pixel found with a value of '2' and not forming part of the right hand side boundary as an 'ON' switch and each pixel found with a value '2' on the right hand side boundary as an 'OFF' switch. Between 'ON' and 'OFF' switches all pixels having a value '1' are set to '2' to define the region A as shown in Figure 4.

The binary image array of Figure 1 is then scanned until another first '1' is located. The region B to which this '1' belongs is then boundary traced and filled in as described above but the pixels are assigned a value '3'. Similarly for a third region C, the pixels are given a value '4'. The completed array is shown in Figure 4 identifying three image regions within the viewed scene.

In the present case, all but the largest regions are eliminated by re-assigning a value of '0' to the relevant

pixels and the remaining region i.e. the largest is re-converted to a binary image as shown in Figure 5 which can then be used to determine for example, the target aimpoint. Any '0's' found within the selected region corresponding to background are also converted to '1's' using the 'ON/OFF' switching described with reference to the filling in of each boundary traced region.

Instead of choosing and retaining the largest region, a selection can be made on the basis of a degree of correspondence between the shape and size of each region and that of a predetermined or calculated model. Alternatively, selection can be made on the basis of size order but instead of taking the largest, the smallest or particular intermediate sized region can be taken.

CLAIMS

1. A method of discriminating between regions in a binary image array corresponding to a viewed scene, the method comprising:-

tracing the boundary of each region and assigning the pixels of each boundary a value indicative of the respective region;

filling each pixel within the boundary of each region with the said value indicative of that region; and

selecting one of said regions by reference to its size relative to that of the other regions and/or by reference to the degree of correspondence between the shape or size of the region and that of a predetermined or calculated model.

2. A method of discriminating between regions in a binary image array corresponding to a viewed scene, substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawings.

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